REMARKS

I. Application Status

Claims 1 and 3-36 are pending; claims 1-11, and 14-36 are rejected under U.S.C. § 102 and/or 103; and claims 12 and 13 are objected to, but would be allowable if rewritten in independent form including all limitations of the base claim.

With this response, claims 1, 3-9, 11-12, 14, 16, 18, 20, 22-27, 30, and 31 are amended; and claim 2 is canceled. Claims 1, 3, 30 and 31 are amended to recited an alloy "having an equilibrium solid solubility of at least 1 wt.% in the noble metal," as recited in original claim 2. Claims 1, 3, 30 and 31 are also amended to recite that the flexible member is "freestanding." Support for this amendment is found throughout the specification, for example, in Figure 1,which illustrates a freestanding cantilever beam, and at page 8, lines 5-7. Claims 22 and 23 have been rewritten in independent form. Dependent claims have been amended to reflect changes made to independent claims. No new matter is added. Reconsideration of the claims, in view of the remarks that follow, is respectfully requested.

II. The Invention

The invention relates to a microelectromechanical device having a flexible member that is made from an alloy including one or more noble metals selected from the group of Au, Pt and Pd alloyed with one or more alloying elements selected from the group of Ir, Ru, Rh, Pd, Au, W, Os and Ni. The alloying element is selected to improve a performance characteristic such as yield strength, tensile strength or hardness.

III. Rejection of the claims over Golecki et al.

Claims 1-11, 25-27, 29 and 31 stand rejected under 35 U.S.C. § 102(a) as being anticipated by US 2001/0049193 (Golecki et al.).

Claims 1-11, 25-27, 29, 31 and 3-36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US 2001/0049193 (Golecki et al.).

Golecki et al. describe an electromechanical device including "structures having a movable portions 12, 12a and support portions 14, 14a;...the movable and support portions are made from a crystalline material, e.g., a silicon-containing material such as monocrystalline silicon." See paragraph [0032]. Golecki et al. further disclose a current-carrying metallization layer on the structure ("an electrically conductive material layer 38 which is formed *over the structure* and positioned to *carry electrical current*" Paragraph [0039] (emphasis added)), and which may be "iridium, rhodium, osmium, tungsten and alloys thereof" (Paragraph 0012).

The metallized layer is supported by the structure and is not freestanding. Thus, Golecki et al. do not teach or suggest a freestanding, flexible member made from an alloy including a noble metal and an alloying element, as is recited in all the instant claims.

Further, the teaching of Golecki et al. is directed to obtaining "more stable metallization." See Paragraph [0007]. As such, Golecki et al. seek a conductive layer having "reduced or no interdiffusion" with the underlying layers, "low electrical sheet resistance", "good bondability" and "stress...as low as possible." Paragraph [0007]. The selection of the conductive layer composition clearly is directed to optimizing characteristics of a supported thin film, not a freestanding flexible member. Thus, Golecki et al. provide no guidance or motivation to make a freestanding flexible member using a conductive alloy and, there is no teaching or suggestion of a freestanding flexible membrane made from the alloy recited in the instant claims.

For the foregoing reasons, it is submitted that Golecki et al. do not teach or suggest the invention set forth in claims 1 and 3-36. It is respectfully requested that the rejection be withdrawn.

IV. Rejection of the claims over Sun.

Claims 1-11, 18, 20, 25-27, 29 and 31-32 stand rejected under 35 U.S.C. § 102(a) as being anticipated by US 6,307,452 (Sun).

Claims 1-11, 18-21, 23, 25-27, 29 and 31-32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US 6,307,452 (Sun).

Sun discloses a microelectromechanical switch including a platform and folded springs supported above a substrate (col. 3, lines 6-10). The disclosure is primarily directed to folded springs prepared from a bilayer including an electrical insulation layer and an electrically conductive layer (col. 3, l. 33-35). The sole reference to an alternative embodiment is the statement that the platform and folded springs may be "formed of a single conductive material layer such as gold, nickel, platinum, Rh and alloys thereof" (col. 4, l. 35-37). No specific alloy compositions are described.

The Office Action suggests that Sun anticipates the instant invention because the Sun device is formed from the same materials as the instant invention and therefore the same performance characteristics are expected. However, Sun does not teach or suggest a particular combination of "gold, nickel, platinum, Rh" so as to obtain an alloy comprising a noble metal "selected from the group consisting of gold, platinum and palladium" and an alloying element "selected from iridium, ruthenium, rhodium, tungsten, osmium and nickel," as is recited in claims 1, 3, 30 and 31, and those claims dependent thereon. Nor does Sun teach or suggest that the "alloying elements form a solid solution with the one or more noble metals having an equilibrium solid solubility of at least 1 wt.% in the noble metal," as is recited in claims 1, 30 and 31, or that "each of the alloying elements have an equilibrium solid solubility of at least 1 wt.% in the noble metal, and wherein the one or more alloying elements are present in an amount

that does not result in precipitates," as is recited in claim 3. Indeed, Sun does not even indicate that an alloy would provide *any* specific benefit over a pure noble metal, much less that the alloy "provides at least one performance characteristic at least 50% greater than the noble metal alone, said performance characteristic selected from the group consisting of yield strength, tensile strength and hardness," as is recited in claim 1 and 30.

Regarding claim 23, there is no explicit disclosure of an alloy made up from "about 70 wt.% Au and about 30 wt% Pt, wherein the platinum and gold are present in an amount sufficient to at least one performance characteristic at least 50% greater than either noble metal alone, said performance characteristic selected from the group consisting of yield strength, tensile strength and hardness."

The Office Action further suggests that the claimed alloy compositions would have been obvious because the "composition *appears* to reflect a results-effective variable that can be optimized." Office Action at page 5 (emphasis added). However, Sun does not even recognize that an alloy would provide any specific benefit over the pure noble metal. In order to even begin optimization of a process or product, one must first recognize a parameter as being worthy of optimization. Sun completely lacks this realization, as is reflected and reinforced in the Office Action's characterization of the reference as only "appearing" to reflect a results-oriented variable.

For the foregoing reasons, it is submitted that Sun does not teach or suggest the invention set forth in claims 1 and 3-36. It is respectfully requested that the rejection be withdrawn.

V. Rejection of the claims over Hill et al.

Claims 1-11 and 25-30 stand rejected under 35 U.S.C. § 102(e) as being anticipated by US 6,236,139 (Hill et al.).

Hill et al. describe a microelectromechanical structure (MEMS) including springs "formed of various materials having suitable strength and flexibility such as silicon or a conductive metal" (col. 12, l. 22-24). The only disclosure of a noble metal alloy is as a plating material for an electrical contact in a MEMS device. Hill et al. disclose electroplating selected surfaces of a MEMS structure "in order to more precisely define the size of the gap that is part of a MEMS structure." The electroplating material may be a conductive material, "such as gold, rhodium, silver, rhuthenium, palladium, or alloys thereof".

The conductive plate is supported by the MEMS surface onto which it is deposited and is not a freestanding member. Thus, Hill et al. do not teach or suggest a freestanding flexible member made from an alloy including a noble metal and an alloying element, as is recited in the instant claims.

The Office Action suggests that Hill et al. anticipates the instant invention because the Hill et al. device is formed from the same materials as the instant invention and therefore the same performance characteristics are expected. However, Hill et al. do not teach or suggest the particular alloys disclosed in the instant claims 1, 3, 30 and 31 (and those dependent thereon), namely, an alloy comprising a noble metal "selected from the group consisting of gold, platinum and palladium" and an alloying element "selected from iridium, ruthenium, rhodium, tungsten, osmium and nickel." Because the particular combinations of alloying elements is not disclosed by Hill et al., the reference does not disclose an alloy composition that "provides at least one performance characteristic at least 50% greater than the noble metal alone, said performance characteristic selected from the group consisting of yield strength, tensile strength and hardness," as is recited in claim 1 and 30.

For the foregoing reasons, it is submitted that Hill et al. does not teach or suggest the

invention set forth in claims 1 and 3-36. It is respectfully requested that the rejection be withdrawn.

VI. Rejection of the claims over Pearson et al. (US 2003/0216700).

Claims 1-11, 14, 20, and 26-27 stand rejected under 35 U.S.C. § 102(a) as being anticipated by US 2003/0216700 (Pearson et al.).

Claims 1-11, 14-15, 20, and 26-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US 2003/0216700 (Pearson et al.).

The Office Action suggests that Pearson et al. describe a microelectromechanical device. In fact, Pearson et al. disclose a catheter including a flexible core housed within a catheter tube. See Paragraph [0008]. The flexible core is included to prevent kinking of the catheter and may optionally include a radiopaque material, such as a heavy metal. Paragraph [0010]. The radiopaque material is either embedded in or surrounded by a polymeric material.

The flexible core of the Pearson et al. catheter is incapable of functioning as a freestanding, flexible member of a MEMS device, which should be able to return to its initial position one a force is removed. This is not disclosed or suggested (or even possible) in Pearson et al.

Furthermore, there is no teaching or suggestion of a flexible member formed from an alloy including "one or more noble metals selected from the group consisting of gold, platinum and palladium; and one or more alloying elements, the elements selected from iridium, ruthenium, rhodium, tungsten, osmium and nickel," as is recited in claims 1, 3, 30 and 31 (and those dependent thereon).

The Office Action suggests that the specific alloy composition of claim 15 (about 65 to 99.9 wt% Pt and about 0.1 to 35 wt% Ir) is obvious because "one of ordinary skill would know

how to optimize based on the final desired result since the composition determines the properties of the final product." Office Action at page 6. However, as noted above, Peasrson et al. is directed to a catheter having a flexible core for reducing kinks in the catheter during use. The presence of any metals in the catheter is solely to provide a radiopaque material for monitoring the device in vivo. Nothing in the Pearson et al. disclosure suggests a flexible member of a MEMS device, much less suggest that the flexible core composition might be modified so as to optimize a device performance characteristic (such as yield strength, tensile strength and hardness) that is not even contemplated by the Pearson et al. reference.

Applicants respectfully request that the rejection be withdrawn.

VII. Rejection of the claims over Khandros et al.

Claims 1-11, 16, and 26 stand rejected under 35 U.S.C. § 102(a) as being anticipated by US 6,476,333 (Khandros et al.).

Claims 1-11, 16-17 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US 6,476,333 (Khandros et al.).

Khandros et al. disclose a flexible interconnect used to make electrical connections in a semiconductor device. While the element needs to be flexible to maintain contact between elements of the semiconductor device, there is no need for the interconnect to have the low hysteresis required of MEMS devices. Therefore, the disclosed materials do not teach or suggest the particular alloys of the claimed invention.

The interconnect consists of a flexible elongate element and a conductive shell completely covering the elongate element (col. 5, l. 18-20). The elongate member is formed from a conductive material such as Au, Al or Cu alloyed with Be, Cd, Si or Mg; metals or metal alloys of the palladium group; or lead, tin, indium and their alloys (col. 4, l. 49-54).

The shell possesses desirable conductive and mechanical properties (col. 5, l. 28-29), and the composition is varied accordingly. The selection of the shell composition is described at column 5, line 46. of the specification:

> When it is desired to have a contact structure which deforms elastically, the shell 116 can be formed of a conductive material such as copper or solder, exemplified by lead-tin solder. When it is desired to have the shell 116 have spring properties, nickel, iron, cobalt or an alloy thereof can be used. Other materials which would render desirable properties to the shell 166 *(sic)* in certain applications are copper, nickel, cobalt, tin, boron, phosphorous, chromium, antimony, gold, silver, rhodium, palladium, platinum, ruthenium, and their alloys. Typically, the top layer comprising the shell, if it is required, consists of gold, silver, metals or alloys of metals of the platinum group or various solder alloys.

As an initial matter, Khandros et al. does not teach or suggest and elongate member made up of an alloy containing a noble metal from the group of "gold, platinum and palladium," alloyed with an element from the group of "iridium, ruthenium, rhodium, tungsten, osmium and nickel," as set forth in claims 1, 3, 30 and 31. None of the claimed alloying elements are disclosed or suggested for the elongate member.

Furthermore, the shell is not a freestanding member, as it is supported by the elongate element and therefore does not teach or suggest the claimed freestanding flexible member. Nor is there a teaching or suggestion of a shell made from the specific alloys disclosed and claimed by the instant invention. Khandros et al. do not suggest a particular combination of "copper, nickel, cobalt, tin, boron, phosphorous, chromium, antimony, gold, silver, rhodium, palladium, platinum, [and] ruthenium" so as to obtain an alloy including a noble metal "selected from the group consisting of gold, platinum and palladium" and an alloying element "selected from iridium, ruthenium, rhodium, tungsten, osmium and nickel," as is recited in claims 1, 3, 30 and 31, and those claims dependent thereon.

Nor does the Khandros et al. reference provide any teaching or guidance to select an alloy that "provides at least one performance characteristic at least 50% greater than the noble metal alone, said performance characteristic selected from the group consisting of yield strength, tensile strength and hardness," as is recited in claim 1 and 30. (Recall that the performance criteria for an interconnect are very different than those of a MEMS device). Furthermore, Khandros et al. do not disclose an alloy containing a solid solution of alloying elements "having an equilibrium solid solubility of at least 1 wt.% in the noble metal," as is recited in claims 1, 30 and 31, or "wherein each of the alloying elements have an equilibrium solid solubility of at least 1 wt.% in the noble metal, and wherein the one or more alloying elements are present in an amount that does not result in precipitates," as is recited in claim 3.

The Office Action suggests that "it would have been obvious to one with ordinary skill in the art to deposit to the composition cited because the composition appears to reflect a result-effective variable that can be optimized." Office Action at page 6. For the reasons stated above, Khandros et al. do not provide any guidance as to how to select and combine the elements listed in order to obtain an alloy of a particular performance characteristic. Indeed, Khandros et al. teaches away from the claimed combinations by suggesting nickel, iron, cobalt or alloys thereof should be used when it is desirable for the shell to have spring properties (col. 5, l. 49-51).

For the foregoing reasons, it is submitted that Khandros et al. do not teach or suggest the invention set forth in claims 1 and 3-36. It is respectfully requested that the rejection be withdrawn.

VIII. Rejection of the claims over Sayama.

Claims 1-11, 22, 26, and 29 stand rejected under 35 U.S.C. § 102(e) as being anticipated by JP 05-174932 (Sayama).

As an initial matter, a Japanese patent application cannot be used as a basis for rejecting a claim under section 102(e). However, the application is available as a printed publication as of July 13, 1993, and may form the basis of a prior art rejection under other sections of the patent statute. The substance of the reference is therefore addressed below.

Sayama discloses a slide contact having multiple metal ribbons alternatingly composed of an alloy having good spring characteristics and an alloy having good electrical properties. Sayama discloses an alloy including 30 wt.% Ag, 35 wt.% Pd, 10 wt.% Au, 10 wt.% Pt, 10% wt.% Cu and 1 wt.% Zn.

The Office Action suggests that the Sayama device anticipates the instant invention because the Sayama flexible member is formed from the same materials as the instant claimed invention and thus inherently possesses the same properties. However, the Sayama alloy does not include an alloying element selected from "from iridium, ruthenium, rhodium, tungsten, osmium and nickel," as is recited in claims 1, 3, 30 and 31, and those claims dependent thereon. Thus, Sayama does not anticipate the claimed invention.

Furthermore, the alloying elements (Ag, Cu, Zn) taught by Sayama will have undisclosed effects on the equilibrium solid solubility of the alloying elements, the precipitate formation of the alloying elements, and performance characteristics such as yield strength, tensile strength and hardness. In light of the presence of these additional elements, whose effect on the alloy properties is neither disclosed nor explained, Sayama neither teaches nor suggests the claimed features of the instant invention.

As to claim 22, Sayama does not disclose an alloy "consisting essentially of about 1 to 99.9 wt% platinum and about 1 to 99 wt% palladium, wherein platinum and palladium are present in an amount sufficient to provide at least one performance characteristic at least 50%

greater than either noble metal alone, said performance characteristic selected from the group consisting of yield strength, tensile strength and hardness." Thus, Sayama does not anticipate claim 22.

For the foregoing reasons, it is submitted that Sayama does not teach or suggest the invention set forth in claims 1 and 3-36. It is respectfully requested that the rejection be withdrawn.

IX. Rejection of the claims over Duchet.

Claims 1-11, 24, 26-27 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Duchet (FR 2458151).

Duchet discloses a piezoelectric device including a metal strip made of low thermal expansion alloys such as Durinval, Elinvar and Therelast. One-half of the upper and lower surfaces of the metal strip are covered with a $LiNbO_3$ piezoelectric plate, and the piezoelectric plate is metallized with gold, chromium and nickel to allow contact with external terminals. The Office Action suggests that Duchet discloses a gold-chromium-nickel alloy flexible member.

As an initial matter, the metallization layer is a very thin film ($1\mu m$) that is contactingly positioned on a piezoelectric plate and therefore Duchet does not disclose or suggest a freestanding flexible member, as recited in the instant claims.

Furthermore, a metallization layer typically is formed by sequential deposition of nickel, chromium and gold, resulting in a stacked metal structure, so that Duchet does not teach or suggest an alloy layer.

Lastly, there is no teaching or suggestion of an alloy layer made from "of one or more noble metals selected from the group consisting of gold, platinum and palladium, and one or more alloying elements, the elements selected from iridium, ruthenium, rhodium, tungsten,

osmium and nickel," as is recited in all the instant claims, much less the specific composition recited in claim 24.

For the foregoing reasons, it is submitted that Duchet does not teach or suggest the invention set forth in claims 1 and 3-36. It is respectfully requested that the rejection be withdrawn.

X. Conclusion

For the foregoing reasons, it is submitted that the claims are in condition for allowance. A favorable Notice to that effect is respectfully requested.

AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees should any be required for this submission, or credit any overpayment to deposit account no. 08-0219.

In the event that an Extension of Time is required, the Commissioner is requested to grant a petition for that Extension of Time which is required to make this response timely and is hereby Authorized to charge any fee for such an Extension of Time or credit any overpayment for an Extension of Time to Deposit Account No. 08-0219.

Respectfully submitted,

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